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THE
PHYSIOLOGY OF VOCALISM.

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THE PHYSIOLOGY OF VOCALISM.

ABOUT 1880 I commenced vocal training under the instruction of Mr. W. H. Stockbridge. I very soon discovered that the vocal physiology as described in the current literature was altogether wrong. This led me to a study of the subject, the results of which I embodied in a paper which was published in the "Independent Practitioner" in 1888. Most of the conclusions then formed have so well borne the test of ten years of re-examination that I shall quote largely from that article in this paper.

In 1889 Morrell McKenzie* published a paper on "Speech and Song"; I shall also quote from him as corroborating my conclusions.

The organs used in vocalization and articulation, are the muscles of the thorax and abdomen, the lungs, the vocal cords contained in the larynx, the epiglottis, the gradually enlarged pharynx, the soft palate and the uvula, also the bones of the nose and head, and the passages and cavities formed by them. The special organs of articulation are the lips and tongue.

The action of the soft palate has, perhaps, greater influence upon the tone of the voice than that of any other organ. I have consulted many treatises on both singing and speaking, and nearly every writer has entirely misconceived the action of the velum. Drs. Flint and Lennox Browne are the more notable exceptions. It affords me satisfaction to observe that teachers of singing and speaking are, in most cases, giving much better instruction than is written in the books.

Some physiologists have described the action of the soft palate, as observed by them, but in wrongly educated subjects.

Dr. Kingsley says: "Pure vocal sounds can be made by the resonance of the buccal cavity alone. Let any other cavity communicate with it, and the purity of the vowel sounds is destroyed. If there is any escape of breath or sound, however small, behind the curtain of the palate, the vowels will be nasalized."

Dr. Carl Seiler states: "The cavities of the naso-pharynx and nose are separated from the direct influence of the vibrations of the vocal cords by the adaptation of the soft palate to the pharyngeal wall."

Dr. Seiler conceives the head cavities to be a reinforcing power, but thinks they are set in vibration through the walls of the

palate, and not through an opening behind the velum.

This is entirely at variance with facts, as verified by my own experience and observation. The true office of the soft palate is not to close but to modify the opening into the nares, and thus attune the resonant cavities to the pitch and timbre of the note given by the vocal cords, throat and pharynx.

The uvula serves as a valve to more accurately adjust the opening behind the soft palate to the note of the voice.

A sound confined to the throat and mouth is harsh, weak, and without penetrating power; but aided by the reinforcing vibrations of the nasal and head cavities, the voice becomes soft, strong, and far-reaching, and agreeable to the ear of the listener.

The organs which give forth the human voice constitute a musical instrument of great range and power. Every truly musical instrument has in it three elements—a power, a vibrator, and a resonator. The violin has the bow for a power, the string for a vibrator, and a hollow body with its contained air for a resonator. The French horn has the lungs of the player for a power, the lips for a vibrator, and the gradually enlarging tube, terminating in the flaring bell shape to produce the quality and resonance.

In all of these instruments, the quality and power of the tone depend upon the presence of these three parts, and their perfection of construction and proper relation as regards each other as to size and position, and upon the perfect use of each part.

A split sounding-board spoils the piano, a "cracked fiddle" is the synonym for every thing disagreeable; and the indented bell destroys the lovely tone of the French horn.

The human vocal instrument has these three elements, and each element variable according to the will or feeling of the player. This constitutes a modifying power, which gives a variety of quality possible in no other instrument, and makes it the wonder and admiration of mankind. To these is added another element—organs for articulation.

In this human instrument:

1. The lungs give the power.
2. The vocal cords are the vibrator.
3. The nasal and head cavities are the resonator.
4. The tongue and lips are the articulator.

The modification of these parts, produced by the feelings of the singer or speaker, give qualities of tone expressive of any emotion a

person may feel, as pain or pleasure, grief or joy, courage or fear.

"The primary sound generated in the larynx is modified by the shape, size and density of the parts through which the vibrating column of air has to pass before it issues from the barrier of the teeth. These "resonators" include the part of the larynx above the vocal cords, with the little sounding-board the epiglottis, covering it; the upper part of the throat or larynx, the nasal passages with certain echoing caves in the bones of the skull which communicate therewith; and the mouth, with the soft palate and uvula, tongue, cheeks, teeth and lips. It is to those resonators, as well as to the size and shape of the larynx itself—and those parts, like the features of the face, are never exactly similar in any two individuals—that the distinctive quality, or timbre, of the voice is due."

The quality and power of resonance is well illustrated by a tuning fork, which, if set in vibration, can, unaided, be heard but a little distance, and only faintly; but if rested upon a table or plate of glass, or, better, upon the edge of the bridge of a violin, it will set up vibrations of the same pitch and character, which are distinctly heard throughout a large hall. A column of air, contained in a cylinder or pipe of the size and length to reproduce the note, or a bottle with the neck the right size, will produce the same effect when the vibratory fork is held before the opening; but if the opening be stopped up, the vibrations can be only imperfectly and faintly reproduced.

The walls and contained air of the head cavities, which consist of the mastoid and ethmoid cells, the antra, vomer, turbinated bones, and frontal sinuses, present a vibratory surface of scarcely less than fifty square inches, and contain from twelve to twenty cubic inches of air, and constitute a resonator of wonderful power; but if they be shut off from the vibratory cords by closing of the velum against the posterior wall of the pharynx, their resonating power is lost, and the tone goes out undeveloped. The tuning fork was not heard, but the vibrations of the resonant violin upon which it rested were loud and prolonged, and filled the hall. The vibrations of the vocal cords alone are insignificant. It is the vibrations of the resonant apparatus of the human instrument which give pleasure to the ear and are sonorous and far-reaching. The nasal tone so much dreaded by vocal teachers, and the "Yankee voice" is not produced by an open palate, and the vibrations

extending to the nasal passages, but by obstruction of the nasal passages principally by contraction of the *alæ* of the nose. If the nostrils are contracted by muscular actions or by outward pressure, the nasal twang will be produced; but if the nostrils be fully opened a full clear tone is given out. If while giving the prolonged sound of *ng* the exterior opening of the nose be alternately compressed and distended the difference in the sound will be very marked as to nasal quality. The genuine "Yankee tone" seems to be dependent also upon a contraction of the posterior nares and elevation of the dorsum of the tongue; but the pure nasal quality is produced as above described.

That the velum is drawn forward allowing a free passage into the posterior nares during the vowel sounds, I have had proven by observations. Prof. Harrison Allen, of Philadelphia, kindly gave his attention to the matter and made examinations for the purpose and found this to be the case. Dr. I. E. Kimball, of Portland, also verified the conditions, and Lennox Browne makes the same statement.

Singers cannot obtain the best quality of voice except in this way, and as speaking is only modified singing the same rule holds good for the formal speaker as for the singer. Because the singing voice is so much better understood, I have analyzed its production to illustrate the formations and delivery of the speaking voice.

Singing is a formal continuous tone unbroken between the words. Speaking is broken between the words and syllables. Singing is confined to some particular pitch and changes from one pitch to another by regular intervals.

Speaking is unrestrained by such limits and varies without relation to pitch or interval. Yet the accomplished formal speaker uses very largely a definite pitch and musical tone.

"Speech differs from song as walking does from dancing; speech may be called the prose, song the poetry of vocal sound.

Time, which is an essential element of song, is altogether disregarded in speech, while the intervals of tone are so irregular as to defy notation, and are filled up with a number of intermediate sounds instead of being sharply defined.

The voice glides about at its own sweet will in speaking, obeying no rule whatever, while in song it springs or drops from one tone to the next over strictly measured gaps.

Those who have not given much attention to the subject are apt to think of speaking, as Dogberry did of reading and writing, that it 'comes by nature'—that it is, in fact, an instinctive art, which no more needs cultivation for its right performance than eating or sleeping. This is a great mistake.

Speaking, even of that slipshod kind which is mostly used in ordinary conversation, is an art, and as such has to be learned, often with much labor."

The singing and speaking tones are produced by the vocal organs in the same way and are focussed precisely the same with the same resonance; and the same articulation is used with each.

A great deal is said and written about a "pure tone"; but writers do not describe it, and it is meaningless in itself.

We are told to sing and speak natural, for the natural tone is correct. This is also indefinite. What is the natural tone? It is natural for a child to imitate the first sound it hears; it may be the French nasal, the German guttural or the American open-tone. In either case the child imitates and for the child it becomes the natural tone.

To be natural is the hardest lesson to learn, and it is only the result of prolonged and severe discipline. Untrained naturalness is the perfection of awkwardness.

The involuntary functions of organic life are the only ones naturally performed correctly. Nature's method of circulation, swallowing, breathing, and speaking can be depended upon, but unless speaking is established by imitation and discipline, this function will soon be corrupted by false examples. The essential qualities of a tone are now recognized to be softness and resonance, the last making it far reaching and effective. Power and volume are the product of increased resonance and largeness. Resonance is increased by the more perfect focusing of the vibrations. Largeness is acquired by a general expansion of the cavities of the throat, mouth and nose, especially by depression of the tongue. To properly form and deliver a tone, all the organs involved should be correctly trained and well used. Correct breathing is very essential, and this is almost universally conceded to be the lateral abdominal breathing. The lower part of the thorax is enlarged laterally, and the abdomen is enlarged both laterally and anteriorly by the depression of the diaphragm.

The shoulders should never be raised a particle, but should remain as fixed as were

Demosthenes' under the points of the swords hung above him.

Expel the breath by contraction of the abdominal and thoracic muscles; and in proportion as they are trained and strengthened will the possible force and intensity of the tone increase. The weakness of many singers is the result of weak breathing. Observe a sleeping infant; it will afford a perfect example of lateral abdominal breathing, and no one could have a suspicion of sex from any difference in the function. In my judgment all the peculiarities of female breathing are the result of customs practiced in after life. For some purposes in singing the method of a fixed diaphragm and flat abdomen may give greater control of the voice in extreme efforts but such use cannot be well sustained during long-continued speaking or singing. It is a labored, artificial condition and use. The tone should seem to be made in the nose and head, and the vibrations can be plainly felt by placing the finger lightly on the thin bones of the nose or upon the top of the head.

All good singers produce their upper notes in this way; but many take the lower notes differently. I am quite fully convinced that the more nearly the voice is focused, as here described on low tones as well as high, the better the tone will be, and only in this way can the best results of which a voice is capable be obtained.

The centre of articulation is apparently through the upper lip.

If these rules are observed the voice will not be disturbed by articulation, and the speech will seem to be entirely independent of the tone as the articulation of the solo singer is independent of the organ tone which surrounds her, though she sets all the air in vibration by speaking the words.

Many theories are held as to the registers of the voice.

Some claim one, some three, others six. While one at least finds as many registers as there are notes in the compass of the voice.

Register means, as I understand it, a condition of the vocal organs as to position, focus or tension, of one or more parts, which changes when passing from one register to another.

My own studies lead me to the belief that there is but one register, or rather no such thing, further than it applies to the compass of the voice.

Head, middle and chest registers, are artificial divisions made by education. Of one thing I feel sure, that if a singer or speaker

will focus and deliver the tones throughout the compass of the voice, as described in this paper the questions of register need never be raised, and the difficulties of "blending the registers" will never be found.

"If the voice is properly used, the throat hardly ever suffers, but wrong production is a fertile source of discomfort and even disease in that region.

It should be clearly understood that public speaking, in addition to the intellectual aspects, is a physical performance that requires 'wind' and 'muscle' and the perfect management of ones bodily resources, like any other athletic feat. To attempt to speak in public without previous training is like trying to climb the Matterhorn without preparation, and is just as certain to end in failure if not disaster."

Vocal organs used as thus described, will feel no fatigue from reasonable use and hoarseness will be to them unknown, and "minister's sore throat" an unheard of trouble.

To obtain the best results each organ of the voice must not only be well trained, but well formed in all its parts; hence, if the teeth are mal-formed, irregular, or there are spaces between the anterior teeth, or they suffer other mal-arrangement, the quality of the voice will be disagreeably affected.

A prominent upper or under jaw or the absence of one or more teeth render vocalization and articulation more or less imperfect and peculiar.

The palate must also be perfect, and harmony of proportions and relations must exist between all parts of the vocal organs. Artificial substitutes for lost or absent parts, whether they be teeth or palate, can never fully perform the functions of the natural members. The expectations of the patients and their friends may be moderated so far as to be fulfilled; but to the educated ear, the imperfection will be apparent.

The soft palate moves in all directions, not only forward and backward but upward and downward; it also shortens and lengthens.

The training of the larynx must be negative. The position is easily determined by a yawning inhalation. The effort of the mind must be to leave it unrestrained by the action of the supporting and surrounding muscles. The pitch is determined by the interior muscles controlling the vocal cords. Contraction of the muscles exterior to the larynx is one great cause of the throaty tone so common and injurious.

Any exercise, such as lifting, rowing or

using dumb-bells, which requires a fixation of the breath, will strengthen the abdominal and thoracic muscles and increase the breathing capacity. Slow inspiration and expiration will give control of the muscles, and enable one to use at will the power and capacity required.

The vocal cords may be strengthened by use, take vocal exercise frequently, but for a short time, and always within the limits of the voice. Avoid all harshness or stridency of tone; cultivate softness and seek to increase the power by enlarging the cavities of the throat and mouth.

"It is hardly an exaggeration to say that the training of the voice should begin almost in the cradle. I do not, of course, mean that a baby should be taught to squall according to rule, or that the prattle of children should be made a laborious task. But I wish to insist on the importance of surrounding the child, as soon as it begins to lisp, with persons who speak well. "All languages," as old Roger Ascham says, "both learned and mother tongues, are begotten and gotten solely by imitation. For as ye used to hear so ye learn to speak; if ye hear not no other ye speak not yourself; and whom ye only hear of them ye only learn." Quintilian says: "Before all—let the nurses speak properly. The boy will hear them first, and will try to shape his words by imitating them."

The excellent maxim, "*memoria excellendo augetur*," is equally true of muscle, and a singer's thyro-arytænoidei should be in as good condition as a pugilist's biceps. Such modes of life as are good for the general health will also help to improve the voice by expanding the chest and keeping all the organs at their maximum of efficiency.

Of course, the kind and amount of practice that are necessary in the adult would be monstrous in a young child, but there is no reason why, even at the age of six or seven, the right method of voice production should not be taught; singing, like every other art, is chiefly learned by imitation, and it seems a pity to lose the advantage of those precious early years when that faculty is most highly developed. There is no fear of injuring the larynx or straining the voice by elementary instructions of this kind; on the contrary, it is habitual faulty vocalization which is pernicious. The sooner the right way of using the voice is taught, the more easy will it be to guard against the contraction of bad habits, which can only be corrected, at a later period, with infinite trouble.

